MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

EME 3056 – INDUSTRIAL MANAGEMENT
(ME)

12 JULY 2023
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This exam paper consists of 6 printed pages including cover page with four questions only

2. Answer **ALL** questions. All necessary working steps must be shown.

3. Write all your answers in the answer booklet provided.

Question 1

a) John has decided to purchase a car. The car costs RM10,000 and John will pay RM500 as down payment and plans to pay the remainder of the loan off in equal monthly payment over the next 3 years.

i. John knows the effective annual interest rate is 6.16778%. What is the nominal annual interest rate if compounding occurs monthly?

ii. What is John's monthly car payment?

(8 marks)

b) Determine the current amount of money that must be invested at 12% nominal interested rate, compounded monthly, to provide an annuity of RM10,000 (per year) for 6 years starting 12 years from now. The interest rate remains constant over this entire period.

(7 marks)

c) James plans to retire in 30 years. He has RM15,000 to invest now and plans to continue depositing RM500 each month, beginning at the end of this month. If he continues to invest RM500 each month until he retires. How much would he have accumulated by the time he retires? Assume he can earn interest at an annual rate of 15% compounded monthly?

(10 marks)

Continued...

Question 2

a) You owed your best friend RM2,000. Because you are short of cash, you offer to repay the loan over 12 months under the following condition. The first payment will be RM100 at the end of month one. The second payment will be RM100+G at the end of month two. At the end of month three, you will repay RM100+2G. This pattern of increasing the G amount will continue for all remaining months. Draw the cashflow diagram.

i. What is the equivalent G if the interest rate is 0.5% per month?

ii. What is the equivalent uniform monthly payment?

iii. What is the value of G, if the first payment is RM150?

(15 marks)

b) An engineering device is available that will reduce this year's labor costs by RM10,000. The equipment is expected to last for eight years. If laborers obtain an average salary increment of 7% per year and the interest rate is 12% per year.

i. What is the maximum amount that we could justify spending on the device?

ii. What is the uniform annual equivalent value (*A*) of labor costs over the eight-year period?

(10 marks)

Continued...

Question 3

a) A scholarship for technical study is to be established that will pay RM200 per quarter at the beginning of January, May, and September. It is estimated that a fund for this purpose will earn 10% interest, compounded quarterly. What lump sum at the beginning of May, when deposited, will assure that the scholarship may be continued into perpetuity?

i = 10/4 = 2 %
P = 200(P/A, 2 %, 3) = $571.20
A' = 571.20(A/P, 2 %, 4) = RM151.82
For n = ∞
P' = A'/i = 151.82/.025 = RM6,073 deposit

(10 marks)

b) A couple wants to begin saving money for their child's education. They estimate that RM10,000 will be needed on the child's 18th birthday, RM12,000 on the 19th birthday, RM14,000 on the 20th birthday, and RM16,000 on the 21st birthday. Assume an 8% interest rate with only annual compounding. The couple is considering two methods of setting aside the needed money.

i. How much money would have to be deposited into the account on the child's first birthday (note: a child's "first birthday" is celebrated one year after the child is born) to accumulate enough money to cover the estimated college expenses?

ii. What uniform annual amount would the couple have to deposit each year on the child's first through seventeenth birthdays to accumulate enough money to cover the estimated college expenses?

(10 marks)

c) A firm operates in a perfectly competitive market whose total cost varies as TC = X3 - 3X2-10X + 2, and the price of the product they manufacture is given by P = 130-2X, where X is the number of units of output.

i. What optimum number of units should be produced to maximize profits?
ii. What is the profit if the optimum number of units is produced?
iii. What is the number of units that should be produced and sold each month to maximize profit?
iv. Show that your answer in part i) maximizes profit.

(5 marks)

Continued...

Question 4

a) Corbs Engineering Company is considering the purchase of new machines equipment. The CEO of the company has requested that you provide the net present value for the equipment being considered. The relevant data for the new equipment are presented below:

First Cost RM125,000
Annual Income 10,000
Annual Operating Costs 8,000 The first year and increasing by RM750 per year.
Property Taxes 5% of first cost Payable at the end of each year
Salvage Value 8% of first cost CSI has a minimum attractive rate of return (MARR) of 4% and the equipment has an expected useful life of 6 years.

(10 marks)

b) A HiTech Engineering company planning a plant expansion is trying to determine whether it should upgrade the existing controlled environmental rooms or purchase new ones. The presently owned ones were purchased 4 years ago for RM250 000. They have a current quick sale value of RM20 000, but for an investment of RM100 000 now, they would be adequate for another 4 years after which they would be sold for RM40 000. Alternatively, new controlled environment rooms could be purchased at a cost of RM300 000. They are expected to have a 10-year life with a RM50 000 salvage value at that time. Determine whether the company should upgrade the existing controlled environmental rooms or purchase new ones at a MARR of 20% per year.

(15 marks)

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Appendix 1

Present/Past worth of N number of periodic cash flows at period *before* the start of these cash flows

$$PA = A\left(\frac{(1+i)^N - 1}{i(1+i)^N}\right)$$

Future worth of N number of periodic cash flows at period of the *last* cash flow

$$FA = A\left(\frac{(1+i)^N - 1}{i}\right)$$

Uniform Gradient Present worth

$$PG = G\left(\frac{1}{i(1+i)^N}\right)\left(\frac{(1+i)^N - 1}{i} - N\right)$$

Uniform series compound amount

$$AF = \left(\frac{(1+i)^N - 1}{i}\right)$$

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